

628
2

A
M E T H O D
O F
Preventing or diminishing Pain
I N
SEVERAL OPERATIONS
O F
S U R G E R Y.

By JAMES MOORE, *in* *RCS.*
Member of the SURGEONS COMPANY of LONDON. 16

L O N D O N :
PRINTED FOR T. CADELL, IN THE STRAND.
MDCCLXXXIV.

[Price Two Shillings.]

M. E. T. H. O. D.

Prevention of dimming

EVERY DAY OPERATIONS

S. U. R. G. I. C. I. A. N.



LONDON

PRINTED FOR T. CROSBY, IN THE STRAND

BY J. A. M. S.

MEMBER OF THE SOCIETY OF

T O

JOHN GUNNING, Esq. { Surgeons in Extraor-
JOHN HUNTER, Esq. { dinary to His Majesty;

CHARLES HAWKINS, Esq. { Surgeon to His
 Majesty's Household;

AND TO

WILLIAM WALKER, Esq.

SURGEONS TO ST. GEORGE'S HOSPITAL.

GENTLEMEN,

HAVING had the advantage of being
a Pupil, and afterwards House-Surgeon,
of the Hospital, where your professional ta-
lents are exercised; I beg leave to address the
following Essay to You, from whose practice
I formed my earliest ideas in Surgery, as a
small mark of the respect with which I am,

GENTLEMEN,

Your most obedient,

And most humble Servant,

CLIFFORD-STREET,
November 20, 1784.

JAMES MOORE.

I found my earliest interest in the study of the
 small world of the insect world, and when I was
 following fifty to ten from which practice
 I have to state the
 of the hospital, where your professional
 and efficient surgeon
 I have had the advantage of being
 can't say.

November 20, 1964
Cleveland, Ohio

JAMES MOORE

A
M E T H O D
O F

Preventing or diminishing Pain, in
several Operations of SURGERY.

IF any of the professions were, in a particular manner, to be distinguished by the name of humane; we might naturally expect it would be that whose particular object it is, to relieve the sufferings of humanity. And, if a greater degree of compassion and sympathy were looked for among one class of men than any other, we should expect to find it in the breasts of those who pass their lives in the duties of so benevolent a profession.

B Physicians,

Physicians, however, have been accused of a want of feeling for the distresses of human nature, and surgeons of actual cruelty.

If this accusation were just, it would strike with more force at the arts of medicine and surgery themselves, than at the individuals who profess them. For it is impossible to imagine, that men of cruel dispositions would be attracted more than others to the study of arts, whose aim is the alleviation and removal of sickness and pain. It must therefore be the exercise of those arts, which renders physicians and surgeons unfeeling and cruel, and not an original unfeeling and cruel disposition that directed them in their choice of those arts.

If this could be made out, it would deter not only men of benevolent dispositions, but even men of common humanity, from engaging in such professions. For the natural wish of the truly benevolent is, to cherish and cultivate, within their own breasts,

breasts, every sentiment and feeling of humanity. No consideration would prevail on them ; indeed, what consideration could prevail on any of the human race, to adopt professions, whose natural tendency is to eradicate the feelings of a man, and plant in their bosoms those of a demon ?

No accusation of this nature, however, is well founded, against any branch of the healing art ; but what leads the undiscerning into mistake on this head is, that, happily for mankind, the habit of seeing objects of distress, without diminishing the sentiments of compassion in the breasts of the humane, enables them to preserve that composure and presence of mind, which is often necessary for giving effectual relief ; and which, those to whom distressed objects are less familiar, are exceedingly apt to lose.

Indeed, if the above accusation were well founded, it would go to prove, that those people in general, whatever their particular professions may be, who make it a duty to

visit prisons and hospitals, and search in the cells of poverty for proper objects for the exercise of compassion and charity, gradually become hard-hearted; while genuine sensibility dwells only in the breasts of those who fly from scenes of misery, shut their ears against the cry of anguish, and, at the accidental sight of every object of wretchedness, show no emotions but those of horror and disgust. This, however, is so contrary to experience, and every observation on the human character, that it is not worth the trouble of a refutation.

The art of medicine has this advantage over the art of surgery, that the means it uses to accomplish its ends are less painful; but surgery, on the other hand, has this superiority over medicine, that it is more certain.

As the accusation of cruelty is more directly pointed against surgery, I shall confine myself, in what I have farther to say, to that branch of the healing art. Surely
cruelty

cruelty cannot with justice be imputed to an art which preserves the lives of many; and, by transient and temporary pains, saves many more from years of torture.

That some surgeons are cruel, cannot be denied; and the reason is, because all men are not humane. But nothing can be more absurd than the opinion entertained by some people, that a certain degree of cruelty is requisite to enable a man to perform surgical operations with coolness and presence of mind. This is saying, in other words, that to render a man expert in the most essential acts of humanity, it is necessary he should be inhumane. No;—it is necessary he should be a good anatomist, and thoroughly master of his business as a surgeon; it is necessary that he be convinced the patient has no other chance for life and ease; and then a man of common steadiness and the greatest humanity will successfully perform every operation of surgery, and continue the practice through life, without any diminution of his humanity.

If instances are brought of men who are considered as good surgeons, and yet are of a cruel or unfeeling disposition, it would be very easy to prove, that they would be better surgeons if they were men of humanity. For one aim of surgery being to save pain, a humane man is much more likely to take every measure for this purpose than a cruel one. All pain that is not absolutely necessary for the well-performing the operation, adds to the danger of the patient, for pain alone is one cause of fever. But it is not only during the operation, but at every previous and subsequent dressing, that an unfeeling surgeon will be apt to give the patient unnecessary pain, which a surgeon of humanity will always attentively avoid.

It is said, that the unfeeling surgeon will perform the operation as easily and expeditiously as he can for the sake of his own reputation; and when he has occasion to dress the wound, he will, on the same account, affect a tenderness which he does not possess. But it ought to be remembered, that

that people are continually forgetting their assumed, and sliding into their natural characters. Nothing therefore can be more certain, than that humanity of disposition, when joined to knowledge and steadiness, tend to render a surgeon not only more agreeable, but more successful in his practice.

As surgery is in reality one of the most humane, so, from its nature, it must have been one of the most ancient of the arts. The art of curing internal and external diseases was exercised by the same men in the early ages. The same benevolent disposition prompted to the one and the other. But it is natural to think, that, from the temperance of mankind in those times, they would have few internal diseases, while the cultivation of the earth, and other necessary labours must have exposed them to external injuries. These last being visible, would naturally attract their attention sooner, and make a stronger impression on their minds, than hidden diseases could do.

It

It is probable, therefore, that surgery is the most ancient of the two branches of the healing art. When a bruise or hurt of any kind was received, the pain would directly excite the sufferer to movements and contortions of the injured part; but he would soon perceive that this augmented his anguish; and the first discovery in surgery probably was, that it is proper to keep a wounded limb quiet and without motion.

It would be observed likewise, that cold increased the pain of a wound or bruise, which would suggest the idea of covering them. The first coverings would probably be the leaves of herbs and plants. When these became hard and uneasy, they would be removed, and fresh ones applied. In the course of which treatment it would frequently happen, that the injured part would recover, and the leaves would get the credit of the cure. In this manner various plants, which contribute nothing to the healing of wounds, got the name of vulneraries, and afterwards became ingredients in plasters and ointments.

Thus

Thus it seems probable, that the earliest efforts of surgery had no object beyond that of palliating or relieving pain. But, as the art improved, and new diseases occurred, cures of the greatest importance were undertaken. Plants of all kinds were tried, and the whole vegetable kingdom ransacked for external applications that would ease pain, and heal wounds.

But when fighting and war began, many cases must have occurred, in which the applications of herbs could not give relief. Other aids must then have been invented, particularly cutting instruments; for without them, what excruciating pain must have been endured before a forked-arrow could be extracted from the flesh! with what facility can it be removed, by enlarging the wound with a cutting instrument! The very enlargement of the wound must have been remarked in many cases to have hastened the cure, which would give the first hint for the same practice in sinuses and other cases, although no dart or arrow was to be cut out.

The speedy relief given, and the acute pain saved to the wounded by such means, would of course prompt men to invent new instruments of different forms, adapted to the relief of that variety of accidents and disorders to which they are exposed. When the danger was great and immediate, some means very painful in the application were adopted. We know that not only cutting instruments, but even the actual cautery, was used in surgery in the days of Hippocrates—and continued to a very late period, as the only means of stopping violent hæmorrhages, and removing some very obstinate complaints; but the discovery of the circulation of the blood, and a juster notion of diseases, have long since introduced less painful methods of stopping bleedings, and relieving those diseases. Nothing less than to save the patient from immediate death, or to relieve him from excessive and durable pain, could justify the having recourse to so severe a cure as the cautery; and it is to the honour of surgery to have thrown it aside, as soon as an easier one was

was invented. The actual cautery is now never employed but to occasion the exfoliation of diseased bones, where there is no sensibility.

The same desire of saving pain to their patients has induced modern surgeons to reject the use of the scissars, which formerly were much used for the opening of sinuses, and performing other operations. In those days, the opportunities of studying anatomy were few, and an accurate knowledge of that science was by no means universal among practitioners. Conscious of this deficiency, they very naturally were afraid of using the scalpel, lest they should divide some large artery, or injure some nerve or tendon. The feelings of the patient therefore were sacrificed to his safety, and an instrument that bruises as well as cuts was preferred, because it only touches those parts which are contained between the blades.

But of late years anatomy has been cultivated so diligently all over Europe, and has

been taught in this island in particular with such accuracy, that the scissars are entirely left off by surgeons, except in the operation for the hare lip ; and the bistory or scalpel, instruments which give much less pain, and in skilful hands are equally safe, have been universally adopted in their stead.

In performing the operation for the stone, some surgeons formerly used dilating instruments, which, though they greatly augmented the pain, were thought to diminish the danger. Male and female conductors, and other instruments, intended to render this operation less dangerous, were also at different periods introduced ; but in this island they have all been superseded in favour of Sir Cæsar Hawkins's admirable invention of the cutting gorget, which unites ease with safety.

But after every improvement that can be made on the instruments of surgery, and on the manner of operating, still a great degree of pain attends that division or extension

sion of the fibres of the human body, which is requisite in surgical operations. An obvious means of lulling and diminishing this was early tried by giving the patient anodynes internally, some time before he underwent an operation. Opium is the most powerful of this class of drugs, and a moderate dose is highly expedient to abate the smarting of the wound after an operation is over, and to induce sleep; but the strongest dose we dare venture to give, has little or no effect in mitigating the sufferings of the patient during the operation.

The most essential improvements that can be made in surgery are unquestionably those which render operations safer, and diminish the danger of the patient's life. But what can diminish the acuteness of the pain without increasing the danger, is also an improvement very much to be wished. Some people say, what signifies a few minutes pain;—but it is not those who think themselves under the immediate necessity of undergoing

dergoing a furgical operation who are apt to hold fuch language.

The common uneasy fenfation which is included in the general term of pain, is indeed of little confequence. But when people confider the degree of pain given by fome furgical operations, they muft acknowledge, that to diminifh or prevent a few minutes of *fuch* pain, is an object highly defirable, both to the patient and furgeon. Reflections of this kind ftruck me very early after I began to ftudy my profeflion, and I made various experiments without fuccefs, in fearch of fomething which might mitigate the violence of the pain in furgical operations. Of late I refumed the fubject, and reflecting on the nature of the nerves, and on fome facts concerning them, I was led to an idea, which I flatter myfelf, will go a confiderable way to the accomplifhing the object I had in view.

It is known, that the nerves, which arife from the brain, and are difperfed to all
parts

parts of the body, are the immediate organs of feeling and voluntary motion. For when the trunk of a nerve, whose branches are dispersed to any particular part, is cut or tied, the part to which those branches go, immediately loses feeling and voluntary motion. The first thought that occurred to me was, that, to cut the trunk of a nerve going to a limb, might be done with little pain, and enable us to perform the amputation with no pain at all. But a very little reflection convinced me that this was impracticable. For, suppose the amputation of the leg, below the knee, is to be performed; cutting the nerves immediately above the part where the incision is to be made, would not be sufficient; because the skin and flesh below the knee, receive sensation from branches thrown off much higher up. To render the insensibility complete, it would be necessary to cut the two great nerves at the top of the thigh, soon after they issue out of the pelvis. But one of them, the crural nerve, runs in contact with the crural artery and vein; and the

other, the sciatic nerve, runs extremely deep among the muscles, which would render their division at once painful and dangerous.

In an amputation of the arm, the objection to cutting the nerves is still stronger; for the artery below the arm-pit is entangled with a plexus of nerves, which it would be impossible to cut without dividing the artery also.

I then thought my end might possibly be accomplished by compression; and was encouraged in this idea, by having often felt that sensation, which, I suppose, every body has felt some time or other, when we say the leg is sleeping; and which entirely proceeds from compressing the sciatic nerve by sitting in a particular position. In that state, the leg and foot are numbed, and rendered in some measure insensible, and, at the same time, our power of moving them is greatly impaired. It is not till after we have stood up, or varied our posture, so as to remove the compression for a considerable

considerable time, that the sensibility and power of motion perfectly return. I recollected also the experiment which has been so often made on living animals, of putting a ligature around the nerve going to a particular limb, which renders all the parts below the ligature insensible.

It occurred to me, at the same time, that the compression of the nerve might be made much more effectually by means of the tourniquet, than by any posture in which we could possibly sit, and I determined to try the experiment on myself.

For this purpose I placed a compress directly over the sciatic nerve, just as it passes over the inferior edge of the ischium, fixed it with a bandage across the pelvis, between the spine of the ilium and the great trochanter, and then applying the tourniquet, I tightened it as much as I could bear. But, to my surprise, and great mortification, my leg and foot retained their feeling as much as ever.

D

As

As it had always seemed evident to me, that the sleeping of the foot, as it is termed, was owing to a pressure of the sciatic nerve, it now appeared unaccountable that the pressure I had just made, did not produce that sensation. It struck me, however, that although I had turned the tourniquet very hard, yet I might possibly not have made a sufficiently strong pressure directly on the sciatic nerve, from my compress being too thin.

I caused a thicker and larger compress to be made, applied it accurately over the nerve as before, and I tightened the tourniquet so as to make a far stronger pressure upon the nerve than any which could be made by the weight of the body in sitting. But still my limb retained its sensibility, and I felt no sensation like that of the foot's sleeping.

I slackened the tourniquet and removed the whole apparatus, astonished and perplexed at an event so little to be expected!

How

How did it happen that so strong a compression did not produce the same effect with a ligature?

How did it happen, that it did not at least produce a numbness and sleeping in the leg, which a smaller pressure did?

Thinking frequently on this subject, I recollected that this sensation does not take place *immediately* on the pressure of the nerve in sitting; it is necessary to sit for a considerable time before it is felt. This being the only essential circumstance in which the pressure made by the compress and tourniquet, differed from the pressure by sitting, I immediately suspected that the failure of the first in producing the same effect with the second, depended on this alone; I therefore resolved to renew the experiment, and continue the compression as long as I thought I could with safety.

I immediately put this resolution in execution. After the compression had been

continued about fourteen minutes, I felt a tingling in my toes similar to what is felt when the foot begins to sleep; soon after, my toes grew quite numbed; this numbness gradually spread up my leg and thigh, and in half an hour, my foot, leg, and the outside of my thigh, were perfectly insensible; so that when I pricked or scratched them with pins, I felt nothing. I also lost the power of moving my foot; but although I kept up the compression for some time longer, part of the *inside* of my thigh and leg still retained some degree of feeling. I recollected that this must be owing to my not having compressed the crural nerve, which passes under Paupert's ligament, with the crural artery and vein, and the obturator nerve, which passes through the obturator ligament.

I slackened the tourniquet, in great hopes that my next experiment would entirely answer my expectations. Sensation, and the power of motion, gradually returned to my limb, a few minutes after I had loosened the tourniquet.

Being

Being now convinced that to deprive the whole limb of feeling, it would be necessary to compress the crural and obturator nerves, as well as the sciatic, a circumstance I had neglected in the last trial, I determined to renew the experiment in that manner. I perceived, however, with some concern, that this could not be done without compressing the crural artery and vein likewise, and consequently stopping the circulation of blood in the limb.

But this consideration did not prevent my making the experiment soon after. I caused a bandage to be made with two thick compresses, one of which was placed on the crural and obturator nerves, and the other on the sciatic, at the upper part of the thigh. The tourniquet was applied and tightened. The tingling in my toes, followed by insensibility and loss of motion, took place in about the same time as in the last experiment. And in half an hour, the insensibility, which gradually spread itself upwards, was complete; and I

had not the least feeling upon pricking or scratching any part of the limb.

I now sent for Dr. Moore, my father, and for the first time informed him of the experiments I had made; he also tried the effect of pricking my leg with a pin without occasioning the smallest uneasiness; but perceiving my leg red and distended, and being afraid a blood vessel might burst, he unloosened the tourniquet, without allowing it to remain so long as in the last experiment.

There is an uneasy sensation produced by the compression, but how infinitely inferior this is to the pain of amputations, may be conceived from my bearing it easily for so long a period. From those trials I had little doubt, but that by effectually compressing the nerves for a proper time, the whole, or by far the greatest part of the pain in amputations, and some other surgical operations, may be saved to the patient.

Repeated experiments have proved, that cutting or tying a nerve going to a part instantly

stantly destroys sensation, and voluntary motion in that part. Cutting quite through certainly destroys the texture of the nerve; and I have a strong suspicion, that when the ligature is made so tight as *instantly* to stop sensation in the parts below, tying it in that manner destroys its texture also.

But compression does not injure the nerve so much, as either cutting, or such tying. And to this circumstance perhaps it is owing that it requires some time before compression produces that degree of insensibility which is instantly the effect of the other two methods. Be that as it may, it certainly does require a certain time before the insensibility follows the greatest compression. This has never before been observed, or applied to the purpose of preventing the pain in surgical operations.

The idea that a certain fluid, which has been distinguished by the name of animal spirits, flows in the nerves, and that it is by the means of this fluid, and its free egress
and

and regrefs to and from the brain, that motion and fenfibility depend, has been adopted by phyfiologifts of the greateft eminence. Yet as this fluid has never been made evident to the fenfes, but has baffled the recherches of the moft dexterous anatomifts, its exiftence can be confidered as no more than a mere hypothefis, and of courfe it is poffible that no fuch fluid does exift. On the fuppofition of fuch a fluid, it might naturally be expected, that upon compreffing the nerves in the manner above defcribed, the numbnefs and lofs of voluntary motion of the parts below the compreffion would take place instantly; whereas, we find, that they happen in a very gradual manner, and are not complete till after a confiderable time. Which feems rather to favour the fufpicion many entertain, that no fuch fluid as the animal fpirits does exift, but that the brain and nerves perform their functions by fome other means, which nobody has ever yet been able to difcover or explain. But however that may be, is of little importance to our prefent purpofe; I return therefore to my fubject,

The

The first notion I had with respect to the manner of rendering the limb insensible previous to amputation, was no other than that which I used when I made the compression on my own thigh; to place compresses of a proper thickness upon the sciatic, crural, and obturator nerves, to apply and twist the tourniquet, and keep it so, till the limb loses all sensation. But as the total stoppage of the circulation for so long a time as is necessary to render the limb completely insensible, will be considered as an objection, I thought of an instrument which will in a great measure obviate this, by effectually compressing the nerves, without entirely stopping the circulation of the blood in the limb. I gave directions to Mr. Savigny in Pallmall, for making the instrument, which I find entirely answers the purpose intended.

A clear idea of the compressor, and the manner it is to be applied, will be conceived from the annexed plate.

Figure I. A, the compressing instrument, being formed of a curved piece of
E iron,

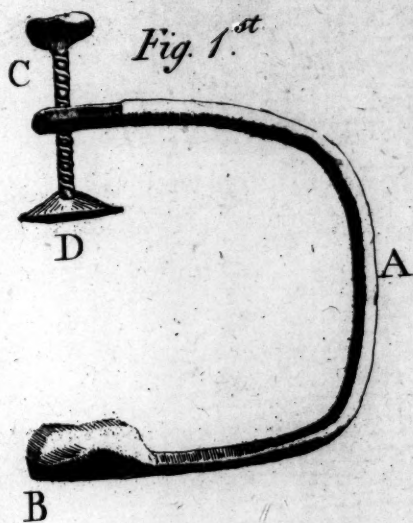
iron, covered with leather, and of sufficient capacity to contain the thigh within its curve.

B, a firm compress of leather, at one extremity of the instrument, which is to be placed on the sciatic nerve.

C, a screw passing through a hole at the other extremity of the instrument, and terminating in D, an oval compress to be placed on the crural nerve.

When this instrument is to be applied, it will be necessary in the first place to search for the sciatic nerve. For this purpose, let the operator feel for the tuberosity of the os ischium, and then for the great trochanter, and supposing a straight line drawn from the one to the other, apply the compress B about an inch above the middle of that line.

The crural nerve is found by the pulsation of the crural artery which runs contiguous to it. The oval compress D must
next





next be applied above it, and upon turning the screw C, the sciatic nerve is pressed by B against the edge of the sciatic notch, and the crural nerve against the os femoris, to any degree that is necessary.

Figure II. represents the instrument adjusted to the thigh. And Figure III. a smaller compressor, suited to the arm.

As all the nerves, which give sensation to the arm, form a plexus in the axilla, close to the humeral artery, the pulsation of the latter will direct the operator where to place the compressor.

Although we are under an absolute necessity of compressing the crural artery along with the nerve, there is not the same necessity of compressing the crural vein; because the latter is the most internal of the three. So that, with attention, the compress may be kept so much towards the outside of the thigh, as to bear upon the nerve without touching the vein.

It is evident, that by this instrument the compression is confined to two points, which are nearly opposite to each other. All the rest of the limb is left free and uncompressed.

We cannot apprehend any bad consequence from the stopping the great artery for an hour or two; for we know that, after the operation for the aneurism in the thigh where the artery is tied, and the circulation through it stopped for ever, yet the anastomosing vessels carry on a circulation sufficient for the nourishment of the limb.

This, however, will render it necessary, in all amputations where the compressor is adopted, to apply the common tourniquet in the usual manner. For without this precaution, although the great artery is obstructed, still the bleeding would be very profuse from the anastomosing vessels.

As soon as the instrument was made, I tried it on my own thigh. After continuing
 3 the

the compression half an hour, I lost all sensation and power of motion below the knee; but the thigh retained a considerable degree of feeling. This is owing to some branches of the lumbar nerves, to the obturator nerve, and branches which the sciatic and crural send off before they descend to the thigh, not being compressed by this instrument. From which it is evident, that the compressor will not be able to diminish the pain in amputations above the knee, in such a degree as below.

I spoke on the subject to some gentlemen of the faculty, who seemed equally pleased and surprised at the effect of the experiments I had made, and thought they ought to be published, as the speediest way of ascertaining so interesting a fact.

Being perfectly convinced myself that the pain of many operations in surgery would be prevented, or at least diminished, by the means I proposed; I was sufficiently inclined not to delay their publication.

Yet,

Yet, as my experiments had been of so confined a nature, I wished that the compressor might be tried in some severe operation, previous to their being made public.

I communicated the experiments I had made, and all my ideas on the subject, to Mr. Hunter, who was so obliging as immediately to offer me an opportunity of trying the effect of my compressor at St. George's Hospital, on a man whose leg he was to take off below the knee within a few days.

I went to the hospital the day before the operation to try the instrument. The patient had lost all his toes, and had a large ulcer on his foot. This was so much inflamed, and so irritable, that dressing it in the gentlest manner gave him acute pain.

I applied the instrument ; after the compression had been continued for about half an

an hour, his limb became so insensible that rubbing pretty smartly with the finger upon the ulcer gave no pain.

Next morning the patient being carried to the operation room, I began the compression of the nerves at a quarter before eleven o'clock. The numbness of the limb followed at the usual time.

At a quarter before twelve, I gave him one grain of opium, to diminish the smarting of the wound after the operation, when the compression should be taken off. A few minutes after twelve, the tourniquet was applied, and the amputation performed by Mr. Hunter, at the usual place below the knee.

At the circular incision through the skin, the patient did not cry out, change a muscle of his face, or shew any symptom of pain. At the subsequent parts of the operation, particularly during the sawing of the bones, he shewed marks of uneasiness in his countenance, but did not cry out.

As

As it was thought necessary to take up no less than five arteries, the operation lasted a longer time than is usual, and towards the end he grew faintish, and desired to have some water, and afterwards asked if they were nearly done.

When the operation seemed to be over, and the bleeding stopt, the tourniquet was relaxed, and I also removed the compressor. But a small vessel bleeding unexpectedly, it was thought necessary to tie it also. Here the patient shewed very strong marks of pain, and afterwards declared, the tying this last vessel gave him much more pain than all the others, although the great nerves had been included in the ligatures.

When he was put to bed, the wound smarted, as is usual after amputations. The compressor being now entirely removed, this was to be expected. But some time after being questioned concerning the pain he had suffered during the operation, he declared that he had felt hardly any, except as he himself expressed it, at the rasping
of

of the bones, which he added had shaken his whole limb. This seems a little extraordinary, as sawing the bones is usually the least painful part of amputations.

Although I expected that the anastomosing vessels would carry on a certain degree of circulation notwithstanding the obstruction of the great trunk, yet I had no idea that it would have been so strong as it was; for, on slackening the tourniquet, the arteries bled per saltum, though the compressing instrument remained in full force on the crural artery.

This trial had all the success I expected; there was evidently a most remarkable diminution of pain, particularly during the first incisions through the skin and muscles, which are generally by far the most severe parts of the operation. And I am convinced that what pain the patient felt, was chiefly owing to some small branches of the lumbar nerves which extend below the knee, and were not compressed.

F

I gave

I gave directions for a smaller compressor to be made for the arm. The instrument may be applied with greater facility, and will probably have a more complete effect in preventing pain in amputations and other operations of this member than in those of the thigh and leg, because all the nerves which convey sensation to the arm and hand, lie together in the axilla. The instrument therefore being applied as in Figure III. will compress the whole plexus at once.

The artery, indeed, which is surrounded with this plexus of nerves will be compressed also. But the circulation here, as in the leg, will be sufficiently carried on by the anastomosing vessels. I tried the smaller compressor on my own arm, and the insensibility followed in rather a shorter time than happens in compressing the nerves of the thigh.

In amputations where the compressor is used, it will be proper to apply it at least an hour and an half before the operation. The uneasiness which this occasions is so small as hardly to deserve mention.

It

It was thought by some of the gentlemen to whom I communicated my ideas on this subject, that it would be necessary to loosen the compressor after the limb is taken off, and, previous to the tying of the vessels, that the surgeon might the more distinctly see those that need to be tied; by which means sensation would return to the parts, and of course there would be the usual pain in tying the vessels. But a surgeon, who is an anatomist, easily finds the great arteries without even the tourniquet's being slackened, which is necessary only for discovering the smaller arteries, and the free manner in which they bled as soon as the tourniquet was slackened in the operation above described, obviates this objection, by proving, that there is no necessity for removing the compression of the nerves, till every part of the operation is finished.

It has already been observed, that the compressor for the thigh acts only upon the sciatic and crural nerves, and can have no effect upon those branches of the lumbar nerves, which come off from within the pelvis, some of which descend below the

knee. But perhaps, applying the common tourniquet, and keeping it tight for a quarter of an hour, or twenty minutes, before the operation, would supply this defect, and blunt, in some degree, the sensibility those branches produce in amputations immediately below the knee. This, however, is an object of little importance, as when the great trunks of the sciatic and crural nerves have been duly compressed for a proper time, the degree of sensibility which the twigs above-mentioned convey, cannot be great.

On removing the compressor after amputations, the patient will no doubt be exposed to the same degree of smarting from the wound, that is usual when the operation has been performed in the common way. All I originally expected from the compressing instrument was, a prevention or great diminution of pain during operations. But I have since entertained a notion, that even the smarting of the wound after amputations of the leg would be greatly lessened, by applying the termination of the compressor B * upon the sciatic nerve, and mak-

* Vide Fig. I. of the Plate.

ing the oval compress D bear on some other part than that where the crural artery vein and nerve are ; by which means the circulation of the blood through the leg and thigh will not be impeded, yet the sciatic nerve will be so compressed as may reduce the smarting to a sensation easily to be endured. But, as I have made no experiment to ascertain this, I hazard it merely as a conjecture.

It may be urged, that compressing the large trunks of nerves, and thereby obstructing the nervous influence for so long a time, may leave a numbness, or some paralytic weakness in that part of the limb which remains. I cannot think, however, that there is the least danger of any such consequence. I have frequently kept the compressor upon my own limbs for a considerable time after all sensibility and power of motion was gone ; and a few minutes after removing it, both returned as entirely as before. The same has taken place with respect to the patient at St. George's hospital, whose leg was amputated.

When

When by a blow on the head, part of the skull is beat down and presses on the brain; or when from the same, or any other accident, extravasated blood is lodged between the skull and brain, and presses upon the latter so as to occasion a stupor and insensibility; though the pressure here is not made on one nerve, but on the origin of *all* the nerves, so as to produce *universal* insensibility; yet, as soon as the depression is removed, or the extravasation evacuated, or absorbed, sensation returns. This is what every surgeon must have had occasion to see frequently. But I am persuaded that, in a short time, experience will prove better than any reasoning *a priori*, or from analogy, that this objection has no weight.

It may be proper here to observe, that all the nerves which go to the thigh, that cannot be compressed by the instrument, are,

1st, The obturator, whose branches are extended on the thigh, and do not reach below the knee.

2d,

2d, One or two small branches, which the crural nerve sends off higher up than the instrument can be fixed, and which are also expanded on the thigh, without reaching below the knee.

3d, Some branches of the lumbar nerves, without names, which are spread on the thigh, and do extend below the knee.

From this account it is evident, that the compressing instrument cannot diminish the sensation in the thigh in such a complete manner as in the leg.

In amputations above the knee, therefore, it will be necessary to use the common tourniquet in the following manner :

Two thick compresses are to be placed upon the great nerves, immediately above where the bone is to be sawed. Then the tourniquet must be applied over them, tightened, and kept in that situation till the thigh becomes insensible.

It

It is impossible to say, before the trial is made, what length of time it will require to render the insensibility complete; but I imagine that, after an hour, very little pain will be suffered from the operation. When the veins become turgid, it will perhaps be right to open one with a lancet, lest any of them should burst. No danger need be apprehended from the loss of blood this will occasion; because the tourniquet will prevent any from flowing, that would not at any rate have been lost on the first incision.

The circulation is never entirely stopt by the tourniquet, so that there will be no danger of any bad consequence, from its being continued tight the time necessary for preventing, or greatly diminishing, the pain of the operation. Whatever happens to the part of the limb that is to be cut off, is of no consequence.

As the keeping the tourniquet tight upon the thigh for so long a time, though attended with no danger, must give more uneasiness

uneasiness than the compressor; it is to be regretted that the insensibility cannot be entirely accomplished by the last instrument as at present constructed. A more commodious and effectual method may probably occur to some other person; and particular improvements will, no doubt, be adapted to particular cases. Mean while, all the inconveniences arising from the use of the tourniquet as a compressor in the manner above described, will be more than compensated by the abatement of pain it will produce.

The strongest objection made to the ingenious manner of amputating limbs, invented by Mr. Allanson of Liverpool, is, that it takes up longer time than the common method, and of course keeps the patient longer in torment. The improvement I have proposed will, particularly in amputations below the knee, and in the arm, remove the whole spirit of this objection, and the full benefit of that gentleman's invention will be enjoyed without inconveniency.

G

A par-

A particular treatment, like that used at Paris, might possibly favour the union by the first intention.

Previous to Lithotomy, amputations, and all surgical operations of importance, except such as from the nature of the case require to be performed instantly, or where the person is already much weakened, it is the practice at Paris, and, I believe, all over France, to make the patient undergo what is called a preparatory course; which is proportioned to the person's strength, and the severity of the operation to be performed, and generally lasts ten days or a fortnight.

If the patient is of a plethoric habit, he is blooded; the rest of the course consists of a few doses of gentle purgatives, a warm bath every second or third day, and a low cooling regimen.

The principal effect expected from this course, is to prevent the violence of the symptomatic fever; and, as far as I could judge, it had that effect.

We

We often observe that weak people, and those who are debilitated by a disease of long standing, recover better after operations, than those who are more plethoric and robust.—This seems to be an argument for the above practice; and I am inclined to think, that a similar course might be adopted with peculiar propriety before amputations performed in Mr. Allanson's manner; because, I believe, such previous treatment would favour his great object of curing the wound by the first intention.

But preventing pain in amputations, is not the only benefit which will arise from compressing the nerves. I flatter myself, many other advantages will attend it. By deadening the sensibility of the parts to be operated upon, the surgeon will be enabled to examine bones that are suspected to be carious, to use the means necessary to produce exfoliations, to lay open abscesses and sinuses, to remove splinters and other extraneous substances from wounds and ulcers, and of course cure them with more certainty and expedition than formerly.

For the patient being enabled to bear the probing, enlarging, and every requisite mode of examination with more tranquillity, the surgeon of course must acquire a more certain and extensive knowledge of the nature of each case, than when his investigations are disturbed by the cries and contortions of the sufferer; and therefore we may reasonably hope, that not only pain, but even limbs and lives may sometimes be saved.

The reduction of fractures and dislocations will also be rendered more easy to the surgeon as well as the patient. For although the muscles, when irritated by extension or otherwise, may still contract a little, yet the compression of the nerves will prevent the patient's having either the power or inclination to resist the efforts of the operator, for restoring the parts to their natural situation.

The dreadful idea many people have, of the pain attending surgical operations, has often of itself the very worst effects.

The

The previous knowledge, therefore, that by this method his pain will be greatly mitigated, will contribute to prevent all that agitation of mind and feverishness which so violent an impression occasions; and of course render every surgical operation, in which compression of the nerves can be used, less dangerous.

It is not impossible, but that the locked jaw, when that dreadful symptom arises from a wound in any of the extremities, may be cured by compressing the nerve between the injured part and the brain.

Some people may imagine, that I ought to have delayed this publication till the effects of compressing the nerves could be fully ascertained, by a number and variety of experiments; but it is principally because I think a number and variety of experiments necessary, that I have ventured to lay all my ideas on the subject, crude as they are, before the Public, without any farther delay; in which I am confirmed by what has happened since the operation.

It

It cannot be imagined, that I consider the few experiments I have had it in my power to make, or the single trial at St. George's hospital, as decisive; but I flatter myself they are sufficient to excite a very thorough investigation; and I am convinced, that whatever farther trials I or my friends could make, would be objected to, as less satisfactory, than those which will be made by impartial men of the profession all over the kingdom.

I have therefore related what first led me to the idea that pain would be prevented or diminished by a continued compression of the nerves; I have stated the experiments I made on myself, and their effects; all I can know at this moment with certainty is, that compression deprived my own limbs, in a very great degree, of sensibility and motion, without leaving any inconveniency after the compression was removed.

From this I concluded, that it would greatly diminish, if not intirely prevent, the pain in several surgical operations;

tions ; but to what degree this conclusion is just, I cannot possibly know with equal certainty. I could only relate the patient's behaviour and assertions who underwent amputation at St. George's hospital, leaving to every one to give what weight to those he pleases. My own full conviction is, that the compression of the nerves in this case produced a very great diminution of the pain he would otherwise have suffered.

Whether by keeping the compressor tight for a longer space of time, or by the additional aid of the tourniquet, the pain in such severe operations can be entirely prevented, or to what degree it may be diminished, will require various trials and accurate investigation to ascertain ; for this may vary in different operations, and perhaps in different constitutions.

Some people possess such firmness of mind, as to despise a considerable degree of pain, and call it nothing ; others are of so delicate and timid a nature, as to cry out with a moderate uneasiness ; and there are
who

who could not refrain from crying at the sight or touch of a surgical instrument, although there was no pain at all. An operator may, on a particular occasion, not place the compress exactly on the nerves, or may not keep up the pressure the proper time. From those, and other circumstances, there may be different accounts, at first, of the effects of the method I have proposed, but the truth will be fully known at last; and no plan that might have been followed, could have ascertained it so soon, and so unexceptionably, as that I have taken.

I already mentioned, that I was advised to give the patient at the hospital a grain of opium, with a view to mitigate the smarting after the operation, and promote sleep. This practice, I believe, is not uncommon; I have always thought it had a good effect; and therefore am of opinion, it ought to be observed, previous to every severe operation.

A gentleman of candour and integrity, eminent in his profession, and who honours

me with his friendship, sometime after the operation, informed me, that this circumstance has been laid hold of, and I have since learnt from others, that very uncandid constructions have been put upon it. This might have given me some uneasiness, if the malice of those insinuations were not entirely defeated by their absurdity. Those whose understandings allow them to believe that a grain of opium could diminish the pain of cutting off a limb, will hardly be convinced of the contrary by *reasoning*. All I shall say to such people is, that if I have discovered that a grain of opium has so great an effect, they must at least allow me the merit of being the first discoverer.

But every body of common sense must see, that the method I have submitted to the Public, does not admit of imposition; its real merit or futility must be known; it will not long be in the power of detraction to stifle the one, nor of friendship to conceal the other.

To attempt imposition, and at the same time to publish the means of detection,

H

would

would be a degree of folly without example; but without such absurdity, a man may wish to publish what he believes will be of public utility, and may think, that even the probability of saving severe torture to some of his fellow-creatures, a stronger reason for doing so immediately, than the risk of offering a defective performance to the Public is for delaying it.

THE END.



BOOKS printed for T. CADELL, in the
Strand.

DOMESTIC Medicine; or, a Treatise on the Prevention and Cure of Diseases, by Regimen and Simple Medicine. By *William Buchan*, M. D. of the Royal College of Physicians, *Edinburgh*. A new Edition. 7s. 6d.

* * * This Treatise comprehends not only the Acute, but also the Chronic Diseases; and both are treated at much greater Length than in any Performance of the like Nature. It likewise contains an Essay on the Nursing and Management of Children; with Rules for preserving Health, suited to the different Situations and Occupations of Mankind. And Directions for the Cure of Wounds, the Reduction of Fractures, Dislocations, &c.

Experiments on the Human Bile, and Reflections on the Biliary Secretions. With an Introductory Essay. By *James Macbarg*, M. D. 4s.

The Chirurgical Works of *Percival Pott*, F. R. S. and Surgeon to St. *Bartholomew's* Hospital. 3 vols. 1l. 1s.

Chirurgical Observations and Cases. By *William Bromfield*, Surgeon to Her Majesty, and to St. *George's* Hospital. 2 vols. illustrated with Plates.

Observations on the Duties and Offices of a Physician, and on the Method of prosecuting Enquiries in Philosophy. By *Dr. Gregory*. 5s.

Medical Observations and Enquiries, by a Society of Physicians in *London*. 5 vols. 1l. 11s.

* * * The 3d, 4th, and 5th vols. may be had separate.

Medical Essays. By a Society at *Edinburgh*. A new Edition. 6 vols. 12mo. 1l. 1s.

Observations on the Diseases of the Army, in Camp and Garrison. In three Parts. With an Appendix, containing some Papers of Experiments, read at several Meetings of the Royal Society. By *Sir John Pringle*, Bart. M. D. F. R. S. A new Edition, corrected, with Additions. 6s.

DIRECTIONS to the BINDER.

Place the Plate fronting Page 26.

Am